SDA
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# Medical and Aromatic Plants Oils

IAE SOFIA
Benaguasil AJUNTAMENT
ESKİŞEHİR İL MİLLİ EĞİTİM MÜDÜRLÜĞÜ
SARIÇAKAYA BELEDİYE BAŞKANLIĞI
ANADOLU ÜNİVERSİTESİ
kuaci KOZMETİK ÜRETİCİLERİ VE ARAŞTIRMACILARI DERNEĞİ
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# ESSENTIAL OIL YIELD OF AROMATIC PLANTS

## Methods of Obtaining Essential Oils

Essential oils are obtained from the parts of medicinal and aromatic plants that carry volatile oils, such as flowers, leaves, and roots, which are called drugs. Since essential oils can evaporate even at room temperature when left out in the open, they are volatile, as the name suggests. They are also called essential oils. There are various methods to obtain essential oils, such as steam distillation, hydrodistillation (water distillation), solvent extraction, and vacuum distillation, but steam distillation and hydrodistillation are the most common. The distillation method to be preferred depends on various conditions, such as the type of plant, the part to be distilled, and the amount of volatile oil it carries.

## Essential Oil Yield

of distillation in plant distillation has always been an important issue for both small-scale or hobby producers and large-scale commercial producers. The essential oil yield of aromatic plants is a subject that directly affects the producer, especially when considered from a commercial perspective.

The volatile oil content found in plants varies depending on many different factors such as the type of plant, its age, where it grows, and when it is harvested. To give an approximate value, the volatile oil content of medicinal and aromatic plants is in a wide range from 0.05% to 18.0%.

The table below shows the Latin names of the main medicinal and aromatic plants from which oil is produced, the drug parts containing essential oil, and the methods applied, along with the average essential oil yields. Essential oil ratios are given as percentages and, as stated above, may vary depending on various conditions.

# Medicinal and Aromatic Plants Volatile Oil Applied with their efficiency Methods

| HERB | LATIN NAME | DROG | METHOD | EFFICIENCY (%) |
|---|---|---|---|---|
| Sage (Medicinal) | *Salvia officinalis* | Leaf | Steam distillation | 1.0 – 2.0 |
| Anise | *Pimpinella Anisum* | Seed | Steam distillation | 2.0 – 4.0 |
| Juniper | *Juniperus communis* | Fruit | Steam distillation | 1.5 |
| Bergamot | *Citrus Bergamia* | Fruit | Cold pressing / Solvent extraction | 3.0 – 5.0 |
| Rosemary | *Rosmarinus officinalis* | Flower and Leaf | Steam distillation | 2.0 |
| Pine | *Pinus sp.* | Leaf | Steam distillation | 0.5 – 3.0 |
| Tea Tree | *Melaleuca alternifolia* | Leaf | Steam distillation | 1.0 – 2.0 |
| Yarrow | *Achilles millefolium* | Flower and Leaf | Steam distillation | 0.15 |
| Bay | *Laurus Nobilis* | Leaf | Steam distillation | 2.0 – 3.0 |
| Dill | *Anethum graveolens* | Above Ground Part | Steam distillation | 0.3 – 1.5 |
| Basil | *Ocimum basilicum* | Above Ground Part | Steam distillation | 0.5 – 1.5 |
| Rose (Isparta) | *Rose x damascena* | Flower | Hydrodistillation / Solvent extraction | 0.02 – 0.03 |
| Daily (Frankincense ) | *Boswellia Carter* | Rosin | Steam distillation | 3.0 – 3.5 |

| | | | | |
|---|---|---|---|---|
| Geranium | *Pelargonium graveolens* | Leaf | Steam distillation | 0.3 – 2.0 |
| Camphor | *Cinnamomum camphora* | Shell | Steam distillation | 2.0 – 3.0 |
| Coffee | *Coffea sp.* | Sunflower seed | Water distillation | 0.12 |
| Cardamom | *Elettria Cardamomum* | Seed | Steam distillation | 8.0 |
| Black pepper | *Piper Nigrum* | Fruit | Steam distillation / Solvent extraction | 2.5 |
| Clove | *Syzgium aromaticum* | Bud Flower | Water distillation | 14.0 – 20.0 |
| Valerian | *Valerian officinalis* | Coke | Steam distillation | 1.0 |
| Oregano | *Thymus vulgaris* | Leaf | Steam distillation | 2.5 |
| Oregano | *Origanum vulgar* | Flower and Leaf | Steam distillation | 1.2 |
| Cumin | *Carum Carvi* | Seeds and Fruits | Steam distillation | 3.2 – 7.4 |
| Coriander | *Coriandrum sativum* | Seed | Steam distillation | 0.3 – 1.0 |
| Lavender | *Lavender officinalis* | Flower and Leaf | Steam distillation | 0.5 – 2.0 |
| Lemon | *Citrus lemon* | Shell | Cold pressing / Steam distillation | 0.5 – 1.0 |
| Lemon Grass | *Cymbopogon Citratus* | Leaf | Steam distillation | 1.0 |
| Mandarin | *Citrus reticulate* | Shell | Cold pressing / Steam distillation | 0.5 |

| | | | | |
|---|---|---|---|---|
| Parsley | *Petroselenium sativum* | Leaf / Seed | Steam distillation | 0.5 |
| Marjoram | *Origanum Majorana* | Leaf | Steam distillation | 0.9 – 1.0 |
| Nutmeg | *Myrtica Fragrance* | Seed | Steam distillation | 8.0 – 15.0 |
| Clary Sage | *Salvia sclaria* | Leaf | Steam distillation | 0.07 – 0.15 |
| Mint (Medical) | *Mentha piperita* | Above Ground Part | Steam distillation | 0.6 – 1.0 |
| Lemon Balm (Balm) | *Melissa officinalis* | Leaf | Steam distillation | 0.10 – 0.15 |
| Eucalyptus | *Eucalyptus globule* | Leaf | Steam distillation | 3.0 – 5.0 |
| Patchouli | *Pogostem cablin* | Leaf | Steam distillation | 2.0 – 4.0 |
| Chamomile (Medical) | *Matricaria recutita* | Flower | Steam distillation | 0.3 – 1.0 |
| Daisy (May) | *Matricaria Chamomile* | Flower | Steam distillation | 0.2 – 0.5 |
| Wormwood | *Artemisia Absinthium* | Flower and Leaf | Steam distillation | 0.5 |
| Orange Peel | *Citrus sinensis pericarp* | Shell | Cold pressing / Steam distillation | 0.5 – 1.0 |
| Orange Blossom ( Neroli ) | *Citrus sinensis flush* | Flower | Steam distillation | 0.1 |
| Fennel | *Foeniculum vulgar* | Seed | Steam distillation | 4.0 – 6.0 |
| Sandalwood | *Santalum album* | Shell | Steam distillation | 4.5 |

| | | | | |
|---|---|---|---|---|
| Cedar Tree | *Juniperus Virginia* | Shell | Steam distillation | 4.5 |
| Sweetgum | *Liquidambar orientalis* | Rosin | Steam distillation / Solvent extraction | 1.1 |
| Cinnamon (China) | *Cinnamomum Cassia* | Shell | Steam distillation | 1.0 – 2.0 |
| Cinnamon (Ceylon) | *Cinnamomum zeylanicum* | Shell | Steam distillation | 0.1 |
| Tarragon | *Artemisia dracunculus* | Above Ground Part | Steam distillation | 0.8 – 1.5 |
| Petitgrain Leaf | *Citrus aurantium folium* | Leaf | Steam distillation | 0.5 |
| Orange Blossom | *Citrus aurantium flush* | Flower | Steam distillation / Solvent extraction | 0.1 |
| Vanilla | *Vanilla Fragrance* | Sunflower seed | Solvent extraction | 0.5 – 3.0 |
| Vetiver | *Vetiver Zizanioides* | Coke | Steam distillation | 0.9 |
| Allspice | *Pimenta Diocese* | Seed | Steam distillation | 4.5 |
| Star Anise | *Illicium verum* | Seed | Steam distillation | 3.0 |
| Ylang Ylang | *Cananga odorata* | Flower | Steam distillation | 2.0 |
| Ginger | *Zingiber officinalis* | Coke | Steam distillation | 3.0 |
| Turmeric | *Curcuma longa* | Coke | Steam distillation | 5.0 |

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# SAGE

## Salvia Spp

Definition :
species of sage in the world belonging to the Lamiaceae family , and the sage species with the highest commercial value is 'medicinal sage' ( Salvia officinalis ) '.

Agriculture:
Sage can be produced both by seed and cutting, and seedlings are generally used in its cultivation. Seedlings are planted in the field with a distance of 45-60 cm between rows and 20-30 cm between rows. Production can be done in dry conditions, and the number of cuttings can be increased with irrigation. Harvesting is done by mowing 10-15 cm above the soil surface at the beginning of flowering. Yield is between 150-600 kg per decare .

Sage Oil:
In medicinal sage, 0.5-3% volatile oil is obtained; in Anatolian sage, 0.9-4.0%. The main phenolic component is rosmarinic acid , which has high antioxidant activity .

Where Used :
Sage is a very valuable product used in functional food, spices, herbal tea, pharmaceuticals, perfumes and cosmetics sectors.

# GOLDEN HERB

## Helichrysum Spp

Definition :
Helichrysum is a plant in the Asteraceae (Daisy) family . The Geartner genus includes nearly 600 species naturally distributed in Europe, Asia, Africa, Australia, Madagascar and New Zealand. The goldenrod, which is a perennial dwarf shrub whose color does not fade even when dried, is also known as the everlasting flower among the public.

Agriculture:
Although it is a natural plant of the Mediterranean basin, it is extremely resistant to cold and drought and has high adaptability. Since it can be easily propagated by seed, it is mostly cultivated by generative propagation method. It can be cultivated easily even in arid, stony and nutrient-poor lands. Land plantation is created by using approximately 5000-8000 seedlings per decare. It has an economic life of 7-8 years, and the most productive periods are between 3-7 years. Harvest is done when 50% of all flowers bloom, that is, in July, from a height of 5-7 cm from the ground.

Goldenrod Oil:
In the full yield period, 800-1000 kg/da of fresh herb is obtained , and 350-400 kg/da of dry herb is obtained by drying this fresh herb . As a result of the distillation of these obtained herbs, approximately 0.8-1 kg/da of essential oil is obtained.

Where Used :
Golden Herb, which has a very wide variation, has different usage properties. Golden herbs are used in perfumery and cosmetics sectors. Especially in the cosmetics sector, its anti- aging feature is used.

# ANISE

## Pimpinella Anisum

Definition :
Anise ( Pimpinella anisum ) is an annual herbaceous plant species from the parsley family, 50–60 cm tall. Its homeland is the Eastern Mediterranean. It is a white-flowered plant from the Apiaceae family. The Pimpinella genus includes 23 species.

Agriculture:
Anise likes a warm, medium humidity climate. It especially likes light or medium weight soils rich in lime and nutrients. Cold, heavy and humid soils are not suitable for anise cultivation. It is an annual plant propagated by seed. Although it varies according to climate conditions, planting is done between the end of January and the middle of March.

Anise Oil :
Anise oil is an essential oil obtained by distillation from the seeds of the anise plant. Anise seeds contain 1.5-5.0% essential oil, 10-20% fixed oil, and 18% protein.

Where Used :
Anise oil, which is the essential oil obtained from anise fruits, is used as a flavoring in the beverage and food industry as well as in the pharmaceutical industry and cosmetic products .

# ROSEMARY

## Rosmarinus officinalis L.

Definition :
Rosemary ( Rosmarinus) from the Lamiaceae family officinalis L.) is an important medicinal and aromatic plant species. Rosemary is a perennial plant with a height of 50 - 100 cm, a bush appearance, does not shed its leaves in winter, and has pale blue flowers.

Agriculture:
It requires sunny or semi-shady places and a mild climate. It requires clayey-sandy, loamy soil rich in organic matter and slightly moist, but it also grows in dry regions. It has many varieties and forms. When cultivated, the desired soil type is loamy soil. Rosemary loves heat and sun and is sensitive to the extreme cold of the winter season. For this reason, it does not grow at very high altitudes. Rosemary can be produced from cuttings and seeds. However, propagation by cuttings is more suitable. Planting can be done in spring and autumn. Planting is done with a planting distance of 40-50 cm in the row x 100-125 cm in the row, so that there will be approximately 2000 plants per decare. When there is a normal rainfall distribution, it is cultivated without irrigation. The plant is harvested by cutting it from 10-15 cm above the ground during the full flowering period.

Rosemary Oil :
Rosemary essential oil is an essential oil obtained by steam distillation.

Where Used :
It is used in many areas such as cosmetics, perfumery, aromatherapy, pharmacy and food. It is frequently used in the food industry in products such as spices and by-products, soft drinks, confectionery, ice cream. In the pharmacy sector, antioxidant and drug raw materials are produced from rosemary. Rosemary essential oil is especially valuable in perfumes, cosmetics and aromatherapy. Antioxidant substances obtained from rosemary, primarily It is used to prevent food products, especially vegetable oils, from spoiling.

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# LAUREL

## Laurus Nobilis

Definition :
Laurel ( Laurus nobilis ) is a valuable medicinal aromatic and spice plant with a wide range of use belonging to the Lauraceae family. The origin of the plant is Anatolia, but it has adapted to regions with Mediterranean climate . It is an evergreen tree that can grow to 8-10m. It is a characteristic type of vegetation called maquis, specific to the Mediterranean climate.

Agriculture:
A typical Mediterranean plant, laurel is very well adapted to regions where summers are hot and dry and winters are warm and rainy. It is very resistant to hot climate conditions, but it is very sensitive to cold . It grows up to 800 m. altitude in Mediterranean climate regions . In our country, almost all laurel leaves are collected from nature. Seedling production is done and gardens can be created.

Laurel Oil :
Essential oil is obtained from both its fruit and leaves. If it is to be grown for fruit, 1/10 male plants should be planted. Quality leaves are obtained at the age of 2 or 3. The oil content in fresh leaves varies between 1-2.5%

Where Used :
It is used in many areas such as cosmetics, perfumery, aromatherapy, pharmacy and food. The parts that have economic importance are the leaves and fruits. The leaves of the plant are used as spices and its essential oil. The fixed oil of its fruits is mostly used. Laurel is widely used in soap making.

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# FENNEL

## Foeniculum vulgare L.

Definition :
the Apiaceae family and has spread to many parts of the world. There are two varieties, bitter and sweet fennel, and the variety cultivated in our country is sweet fennel, which is an annual or at most biennial plant.

Agriculture:
Fennel is mostly produced with its seeds. The appropriate planting time is early spring and approximately 1 kg of seed per decare is planted with a drill at a depth of 2-3 cm with a 35-40 cm row spacing. Weed control must be done for good development . In this regard, fennel cultivation is recommended especially after hoeing plants. Although it is a plant that can be produced in barren conditions, yield increases when grown in irrigated conditions. The plants are harvested by mowing when the seeds are just starting to brown .

Fennel Oil :
The mature seeds of the fennel plant are collected. The seeds are dried and cleaned. Fennel essential oil is obtained by steam distillation. In distillation carried out under standard conditions and with quality seeds, it is generally expected to obtain 2-4 kg of fennel oil.

Where Used :
Fennel seeds are used directly as a spice in food products. In addition, herbal tea is made from its seeds and its leaves and stems are used in kitchen products. The essential oil obtained from its seeds is used in the pharmaceutical, cosmetic and perfumery sectors due to its high pharmacological effects.

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# ROSE

## Rosa Damascena Mill .

Definition :
Rose damascena Mill . (Oil Rose. Pink Oil Rose) Oil Rose; It is a perennial thorny plant that can grow between 1.5-3 m tall, is pink in color , has a semi- double and strong scent, blooms for an average of twenty-thirty days a year , and is highly resistant to winter.

Agriculture:
Oil rose is a temperate climate plant. In the Oil Rose garden facility, plants taken from rose gardens where rejuvenation pruning has been done are used for propagation. Oil rose planting rows are made by laying 50-100 cm long cuttings in 40-50 cm deep planting arcs with 3 m distance between rows. An average of 350-450 kg of rose cuttings should be used to establish a decare rose garden. Oil rose plants can be grown in dry conditions and the yield increases with irrigation. Harvesting starts in May and is done during the average 20-30 day flowering period that lasts until the last week of June. Rose flowers should be collected regularly every day in the early hours of the morning. No pesticide should be applied during the harvest period. An average yield of 350-500 kg/ da can be obtained from an oil rose garden in dry conditions and 750-1000 kg/da in irrigated conditions.

Rose Oil:
Roses are picked early in the morning when the flowers have the highest essential oil content.
Roses are processed while they are fresh. Rose oil is obtained by steam distillation. Rose water ( hydrosol ) and rose oil are separated and stored in a dark and cool place. Under normal conditions, 1 kg of rose oil is obtained by distilling approximately 3.5 tons of fresh rose flowers.

Where Used :
Rose oil, one of the basic raw materials of the perfume, cosmetic and pharmaceutical industries, is used as a fragrance and regulator in the cosmetic and perfumery fields, as well as in the food industry, cleaning and pharmacy.

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# LAVENDER

## Lavender Spp .

Definition :
Lavandula genus from the Lamiaceae family . It is a perennial plant. It has an economic life of about 20 years. There are 39 species of this genus in the world. Several species of the existing species in the world have commercial value. The most cultivated lavender species in the world is Lavandula X intermedia .

Agriculture:
Lavender is not a selective plant in terms of soil. It grows very well in lime-rich, well-drained, and dry and calcareous soils with a pH of 5.8-8.3. It is quite resistant to drought, heat and cold. However, in regions with very harsh winters, it can sometimes suffer from cold damage. Although it is resistant to drought, after the seedling is planted, it should be irrigated 3-4 times at certain intervals to strengthen the plant's relationship with the soil. In later years, lavender plants can be grown in dry conditions in places with an annual rainfall of 400-450 ml and above, but irrigating increases the flower yield per decare. Although it varies according to the variety in lavender cultivation, 175-200 cm between rows and 40-70 cm between rows are suitable for cultivation in the Lavandin type. For Lavender type lavenders, 125-175 cm between rows and 25-35 cm between rows are recommended. In Lavandula X intermedia type lavenders, a fresh flower yield of 800-1200 kg can be obtained from the 4th-5th year

Lavender Oil:
For lavender oil, lavender flowers are collected in full bloom, that is, when approximately 50-70% of the flowers are open. During this period, the essential oil content and quality are at their highest. Harvesting is done between June and August, depending on the region. The amount of oil obtained may vary depending on the type of lavender, growing conditions and distillation method: Lavandula angustifolia oil content generally varies between 0.8% - 1.5%. Approximately 0.8-1.5 kg of lavender oil is obtained from 100 kg of lavender. Lavandula x intermedia oil content is higher (1.5% - 2.5%). Approximately 1.5-2.5 kg of lavender oil is obtained from 100 kg of lavender.

Where Used :
Lavender oil is used in the food industry, cleaning and pharmaceutical sectors, as well as in the cosmetics and perfumery sectors, as a scenting and regulating, calming, pain relieving and aromatherapy oils.

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# OREGANO

## Thymus

Definition:
Thyme is a valuable essential oil and spice plant from the Lamiaceae ( Labiatae ) ( labiate ) family. There are many species defined as thyme and used for this purpose. However, species whose essential oil contains the essential oil components carvacrol and thymol are considered “thyme”. Thyme is a Mediterranean plant. The region between Portugal, Italy and Greece in the Mediterranean is the gene center of thyme.

Agriculture:
Thyme is an annual or perennial, woody, semi-shrub plant with a branching upright form that can grow up to 20-40 cm tall. Its leaves are up to 1 cm long, oval, stemless or short-stemmed. The leaves have glandular hairs that store volatile oil. It is a heat-loving plant. It is resistant to drought and likes areas that receive long periods of sunlight. Despite this, there are thymes that grow in cold climates. Therefore, thyme has winter and summer forms. Winter thyme species are uprooted after 3 years. It is also resistant to cold outside the seedling period and the first planting year.

Oregano Oil:
The yield of thyme oil depends on the type of thyme used, the growing conditions and the distillation method. In general, the essential oil content of thyme varies between 1-3%: Higher quality thyme species such as Thymus vulgaris yield more oil. To increase yield, thyme should be harvested in full bloom. Modern distillation equipment should be used.

Where Used:
Thyme oil has a wide range of uses and is valuable in both medical and industrial areas. The main places and sectors where thyme oil is used: It is used as a spice and flavoring in the Food and Beverage Sector, especially in the Cosmetics, Medical and Health Sectors, and in tea and food supplements.

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# MINT

## Mentha Spp

Definition:
the Lamiaceae family, is a perennial plant. It is the type used in the production of mint oil. It is also called medicinal mint.

Agriculture:
Since medicinal mint is a hybrid species, it is propagated by cuttings. Medicinal mint, whose aboveground part is used, is grown for its essential oil. Mint can grow in practically any soil with a soil pH between 4.5-8.3. However, it is essential that the soil contains normal moisture. It generally grows in sandy-loam, lime-poor, neutral and weakly alkaline, high organic matter and relatively salty soils. It is one of the medicinal plants cultivated in irrigated agricultural lands. Mint cuttings are planted in the land with a distance of 30-90 cm between rows and 15-45 cm above the row, and 5,500 to 7,500 plants are planted. Variety characteristics, physical and chemical structure of the soil are effective in determining the planting distance. Depending on the soil and climate elements, a crop can be obtained in the production area for approximately 3 to 5 years.

Peppermint Oil:
The yield and quality of peppermint oil depends on harvesting the plant during the flowering period. The flowering period is when the oil is most concentrated. Peppermint oil yield depends on the type of peppermint used, growing conditions and distillation method. Peppermint Oil Yield The volatile oil content is usually between 0.5% and 2.0%. Approximately 0.5-2 kg of peppermint oil is obtained from 100 kg of fresh peppermint plants.

Where Used:
Peppermint oil has a wide range of uses and is also used as herbal tea in the food sector. Its essential oils are used in confectionery, chewing gum, liqueur, ice cream and sauces.
It is one of the basic raw materials used in the Cosmetics and Personal Care Industry.

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# DAISY

## Chamaemelum

Definition:
Chamaemelum from the Asteraceae family The most crowded in the world flowering plants is a family. Homeland It is Europe . On the Chamomile Matricaria recutita ( German ) and Chamaemelum nobile (Roman Chamomile) species agriculture busy One in this way is being done .

Agriculture:
Chamomile is a plant that is extremely tolerant to different soil conditions. Different reactions soils (from degraded soil to acid-neutral-alkaline soil) in any soil . However, it is reported that it grows better in humus-rich neutral soils. Its natural distribution areas are generally sandy to loamy, mostly saline. soil. However, since the seeds are very small , they are planted superficially and germination and rapid a seedling needs a lot of moisture for its development. Seedlings are planted in the field in the spring or autumn periods with the distance between rows and above them being 50x50 cm or 70x35 cm according to the appropriate machinery and equipment. Harvesting is done in July-August during the full bloom period by mowing approximately 5 cm above the soil surface. Approximately 800-1000 kg of fresh product can be obtained from one decare of land and approximately 1 kg of essential oil can be obtained from this by steam distillation.

Chamomile Oil:
Approximately 800-1000 kg of fresh product can be obtained from one decare of land and approximately 1 kg of essential oil can be obtained from this by steam distillation. While German Chamomile has a higher oil yield, Roman Chamomile also has a higher oil quality.

Where Used:
Chamomile oil is one of the important oils used in the Cosmetics and Personal Care Sector. Especially in skin care products. It is used in beauty care creams and shampoos. Dried chamomile is often used as herbal tea.